



The importance of propagule form for riparian tree establishment and biogeomorphology in natural rivers

R. A. Francis (1), A. M. Gurnell (1) and G. E. Petts (2)

(1) Department of Geography, King's College London, London, UK (2) School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, UK.
(robert.francis@kcl.ac.uk / Phone: ++ 44 (0)20 7848 1233)

Riparian vegetation is increasingly becoming acknowledged as a highly important functional element of river systems. As such, it is crucial that the many factors, spanning both ecology and hydrogeomorphology, that influence riparian vegetation dynamics are investigated and quantified. Such research can most profitably be performed on river systems that maintain a natural morphology and functional integrity, such as the braided River Tagliamento in NE Italy. This river has been the location of investigations into river island formation and the importance of propagule form in the key process of riparian vegetation establishment.

Three important riparian tree species (*Populus nigra*, *Salix elaeagnos* and *Alnus incana*) along the river were the subject of three years of investigations into the factors affecting establishment of riparian trees via i) seedlings, ii) fragments (branches) and iii) whole deposited trees. Experimental field plots set up on river bars within a pre-alpine reach of the river in 2002 and monitored at the beginning, middle and end of the growing season of 2002 and 2003, combined with growth measurements taken from fluvially-deposited trees, demonstrated substantial differences in growth rate relating to both species and propagule type. Whole trees displayed shoot growth rates over an order of magnitude higher than seedlings and cuttings (e.g. 10.8 mm day⁻¹ for whole *P. nigra* trees, 0.6 mm day⁻¹ for *P. nigra* seedlings and 1.2 mm day⁻¹ for *P. nigra* cuttings). Consequently, the potential for biomass production is far higher from whole trees and large pieces of wood deposited within the river system. This potential is reduced or may be absent from rivers which have lost mature riparian zones, and where whole trees are not eroded from the floodplain or islands and deposited downstream.

Tree survival and growth response to hydrogeomorphological conditions, such as elevation above water table and substrate sediment calibre, also varied according to species and propagule form. Generally, seedlings of the subject species favoured higher relative elevations and fragments preferred lower relative elevations. Whole trees displayed greater survivorship at lower relative elevations. Responses to sediment characteristics were more complicated. These overall variations in response have implications for successful establishment of trees during their early years, when they are most vulnerable to disturbance, and the potential for interactions between the plants and hydrogeomorphological processes such as sedimentation. This research highlights the variability inherent to riparian vegetation that needs to be assessed and quantified if a more profound understanding is to be achieved.